

REMARKS

Claims 12-68 are pending in the application.

By the foregoing Amendment, claims 12, 15, 16, 18, 20-22, 24, 27, 28, 37, 43, 50-52, 54-58, and 62 are amended. New claims 66-68 are added. Claims 1-11 were previously cancelled without prejudice or disclaimer.

Independent claims 12, 22, 24, 28, 37, 43 and 58 are amended to add the feature that the light diffracting means also has the function of “feeding (of) the excitation light into the microscope beam path by diffraction of the excitation light.” This feature is disclosed in original Figures 1 to 3 and in the second paragraph on page 1 of the originally filed description. Claim 50 is amended to follow “means plus function” format in accordance with 35 U.S.C. § 112, paragraph 6.

These changes are believed not to introduce new matter, and entry of the Amendment is respectfully requested.

Based on the above Amendment and the following Remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections, and withdraw them.

Rejections under 35 U.S.C. § 112, ¶ 2

1. “Can be”

In paragraph 9 of the Office Action, claims 12-65 were rejected under section 112, paragraph 2 for indefiniteness, due to inclusion of the phrase “can be” in claims 12, 22, 24, 28, 37, 43, and 58. In order to expedite prosecution, this rejection is overcome by the amendment of claims 12, 22, 24, 28, 37, 43, and 58 to change “can be” to --is--.

However, it is respectfully submitted that this rejection confuses “can be” in its functional sense (governed by MPEP § 2173.05(g)) with “can be” in the exemplary sense (governed by MPEP § 2173.05(d)); and that pursuant to MPEP § 2173.05(g), it is in fact permissible to use “can be” (or the synonymous term “capable of”) in its functional sense.

2. Detection of undiffracted light only

In paragraph 10 of the Office Action, claims 12-65 were rejected under section 112, paragraph 2 for indefiniteness, due to the recitation in claims 12, 22, 24, 28, 37, 43, and 58 of the limitation that only undiffracted light can be detected by the detector means. This rejection is overcome by the amendment of claims 12, 22, 24, 28, 37, 43, and 58 to recite that “the sample emits excitation and wavelength-shifted emission light,” and accompanying amendments to the recitations of the light diffracting or acousto-optical means and the detection means.

Rejections under 35 U.S.C. § 103

1. Claims 12-18-20, 22-32, 37-39, 43-45, 49, 53-55, 57, 63-65

In paragraph 12 of the Office Action, claims 12-18-20, 22-32, 37-39, 43-45, 49, 53-55, 57, 63-65 were rejected under section 103 as being unpatentable over Kobayashi in view of Trutna, Jr. (“Trutna”). This rejection is believed to be overcome by the amendment of claims 12, 22, 24, 28, 37, and 43.

In summary, none of the cited documents describes the following key features of the invention:

a) introducing of excitation light by diffraction in a diffracting element into a microscopic beam path,

b) separating excitation and wavelength-shifted fluorescence light emitted by a sample by diffraction of the excitation light in the diffracting element, and

c) detecting - and consequently arranging the detection means accordingly - light transmitted undiffracted through the diffracting element.

Kobayashi is directed to a laser scanning optical microscope in which a laser beam is scanned in a first direction by means of an acousto-optical deflector 4. In addition, the laser beam is scanned in a second direction perpendicular to the first direction by means of a galvanometric mirror 8.

The function of the acousto-optical deflector in Kobayashi is totally different as compared to the invention as recited in claims 12, 22, 24, 28, 37, and 43.

First, Kobayashi's acousto-optical deflector 4 does not perform the function of feeding the laser beam into the beam path, as in the present invention. Rather, in Kobayashi, the laser beam is introduced into the beam path by means of a beam splitter 2 (Kobayashi, column 1, line 16, Figures 1, 3, 5).

Second, in Kobayashi the acousto-optical deflector does not perform the function of separating excitation and wavelength-shifted emission light emitted by the sample. Rather, in Kobayashi, the excitation and the detection beam path coincide upstream and downstream of the acousto-optical deflector. Even a wavelength dependency of the angles of AOD beam incidence and emergence is compensated for by prisms 4PI and 4PE (Kobayashi, column 5, lines 29 to 32).

Only downstream in the detection beam path of the beam splitter 2 is the excitation beam path separated from the detection beam path, i.e., in Kobayashi, excitation light and emission light are separated not by the AOD 4 but rather by beam splitter 2.

Finally, in contrast to the invention as recited in claims 12, 22, 24, 28, 37, and 43, in Kobayashi, the detector 26 is not so positioned, that only light transmitted undiffracted through the AOD is detected by detector 26. Rather, light diffracted by the AOD 4 and transmitted through beam splitter 2 also is detected by detector 26.

Trutna is concerned with the alignment of a semiconductor wafer with respect to a mask using a diffraction grating on the wafer. There, light is diffracted from a mask grating to a wafer grating and back through the mask grating to produce a set of output diffraction orders. The intensity of the zeroth output order is monitored and the mask is translated and rotated within the plane containing the mask to align the mask with the wafer. Alignment occurs when the intensity of the zeroth output order is at an extremum (Trutna, abstract, lines 1 to 8).

Trutna uses monochromatic light, i.e., the wafer reflects only one wavelength. Consequently, there is no necessity to separate excitation and wavelength-shifted emission light.

Furthermore, since Trutna is not directed to microscopy, it is respectfully submitted that a person of ordinary skill in the art of microscopy would not have considered Trutna. But even if he had done so, Trutna would not have been of any help, since Trutna does not teach separation of excitation light and emission light.

The shielding of the higher diffraction orders by barrier 313 in Trutna serves an entirely different purpose as compared to the invention as recited in claims 12, 22, 24, 28, 37, and 43.

Whereas in the invention, excitation light and wavelength-shifted fluorescence light emitted by the sample are separated by diffraction in the light diffracting element, in Trutna only the zeroth order of diffraction is monitored to obtain a sensitive signal with respect to the alignment of the wafer with respect to the mask.

Further, in Trutna, the excitation light is not introduced into the beam path by the grating on the mask, but rather by means of mirror 311.

In view of the foregoing, it is respectfully submitted that Kobayashi in combination with Trutna would not have yielded the invention as recited in claims 12, 22, 24, 28, 37, and 43, or in claims 13-18, 20, 23, 25-27, 29-32, 38, 39, 44, 45, 49, 53-55, 57, and 63-65 depending therefrom; and that the rejection should be withdrawn.

2. Claims 19, 20, 33-36, 40-42, 46-48, and 51

In paragraph 13 of the Office Action, claims 19, 20, 33-36, 40-42, 46-48, and 51 were rejected under section 103 as being unpatentable over Kobayashi in view of Trutna. This rejection is respectfully submitted to be overcome by the amendments to claims 12, 28, 37, and 43, from which claims 19, 20, 33-36, 40-42, 46-48, and 51 depend, for the reasons stated above with respect to the rejection of claims 12, 22, 24, 28, 37, and 43.

3. Claims 50, 52, 56, and 58-62

In paragraph 14 of the Office Action, claims 50, 52, 56, and 58-62 were rejected under section 103(a) as being unpatentable over Kobayashi in view of Trutna, further in view of Asakawa. The rejection of claims 50, 52, and 56 is respectfully submitted to be overcome by the amendments to claim 28, from which claims 50, 52, and 56 depend, for the reasons stated above with respect to

the rejection of claims 12, 22, 24, 28, 37, and 43. The rejection of claims 58-62 is respectfully submitted to be overcome by the amendments to claim 58, for substantially the same reasons stated above with respect to the rejection of claims 12, 22, 24, 28, 37, and 43.

Further, Asakawa is directed to a beam scanning type optical microscope. There, a plurality of laser lines is coupled into a common beam path by means of beam splitters 13, 14, 15, respectively. Downstream of the laser sources 1, 2, 3 are arranged acousto-optical modulators 7, 8, 9, respectively, with which the light beams of the three colors can be switched. A further AOM 16 positioned downstream in the excitation beam path of AOM's 7, 8, 9 is used to control the overall intensity of the light being introduced into microscope 22.

In contrast to the invention as recited in claim 28, from which claims 50, 52, and 56 depend, and in claim 58, the light of lasers 1, 2, 3 is not coupled or introduced into the common beam path by means of the acousto-optical elements or light diffracting means, but, rather conventionally, by means of beam splitters 13, 14, 15, respectively.

Thus Asakawa also does not teach the key features of the invention of:

a) introducing of excitation light by diffraction in a diffracting element into a microscopic beam path,

b) separating excitation and wavelength-shifted fluorescence light emitted by a sample by diffraction of the excitation light in the diffracting element, and

c) detecting - and consequently arranging the detection means accordingly - light transmitted undiffracted through the diffracting element.

Therefore, even a combination of Kobayashi, Trutna, and Asakawa would not have led to the claimed invention.

Conclusion

All objections and rejections have been complied with, properly traversed, or rendered moot. Thus, it now appears that the application is in condition for allowance. Should any questions arise, the Examiner is invited to call the undersigned representative so that this case may receive an early Notice of Allowance.

Favorable consideration and allowance are earnestly solicited.

Respectfully submitted,

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Date: June 23, 2004

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